

REMARKS

The fuel cell of independent Claim 1 includes a heat exchanger that eliminates moisture in the fuel-containing material. One or more dependent claims requires a heat exchanger that eliminates moisture in the fuel off-gas and/or the air off-gas. The inclusion of a heat exchanger which is able to remove moisture from one or more of the gas streams of present Claim 1 is an essential limitation of the present claims.

Applicants draw the Office's attention to new dependent Claims 15-17 which claim different embodiments of independent Claim 1. New dependent Claim 17 requires the presence of heat exchangers for eliminating moisture in each of the fuel-containing material, the fuel off-gas, and the air off-gas.

Applicants submit that it is readily recognized by those of skill in the art that removing moisture from a gas stream (e.g., dehumidification) is the opposite of humidifying.

The Office rejected the original claims as obvious in view of a patent to Shimanuki (U.S. 6,713,204) in combination with Dickman (U.S. 6,465,118) and Wattelet (U.S. 6,824,906). Office supported the rejection with the following statement:

Shimanuki et al. teach **a fuel cell system including humidifiers** for the oxidant and fuel gases and dehumidifiers for the off-gases. Although **the fuel cell of this system requires that the inlet gases be humidified**, a different fuel cell might require that they be dehumidified, depending on the type of membrane used in the fuel cell (2:64-67; 3:1-67; 4:1-6). (Emphasis added; see paragraph no. 2 on page 2 of the May 18, 2006 Office Action).

The Office conceded that Shimanuki requires that the inlet gases be humidified. In fact, Shimanuki consistently states that a humidifying apparatus is required to increase the moisture content in the prior art fuel gas and the prior art oxidant gas. For example:

The present invention ... provides a fuel cell system, which comprises; a cooling line for cooling a fuel cell with a cooling fluid circulating between the fuel cell and the heat exchanger; one humidifying apparatus of water permeable membrane type.

which humidifies the oxidant gas supplied to the cathode inlet by means of a moisture exchange with a moisture rich cathode off-gas discharged from the cathode outlet of the fuel cell; another humidifying apparatus of water permeable membrane type, which humidifies the fuel gas applied to the anode inlet by means of a moisture exchange with a moisture rich off-gas discharge from the outlet of the anode or cathode of the fuel cell; a heating device for heating the oxidant and fuel gases with a cooling fluid of the cooling line, which absorbs the heat from the fuel cell and flows into the heat exchanger.
(Underlining added; column 2, line 64 through column 3, line 10).

As shown above in Shimanuki, the prior art patent requires the presence of an apparatus that humidifies both the oxidant gas and the fuel gas. This is further reinforced by column 3, lines 16-26 and column 3, line 65 through column 4, line 6 which discloses that the prior art oxidant gas and prior art fuel gas are humidified by the humidifying apparatus of the Shimanuki fuel cell system. Thus, the description of the Shimanuki patent is directly contradictory to the presently claimed invention which requires the presence of a heat exchanger that removes moisture.

Applicants submit that those of ordinary skill in the art would not be motivated by the disclosure of Shimanuki to make a fuel cell that includes any dehumidifying apparatus, much less a dehumidifying apparatus for the fuel gas. Applicants further submit that Shimanuki's description of a fuel cell system that requires the presence of a humidifying apparatus teaches away from the presently claimed invention.

Applicants draw the Office's attention to MPEP § 2145(X)(D) "References Teach Away from the Invention or Render Prior Art Unsatisfactory for Intended Purpose" and MPEP § 2143.01 "The Proposed Modification Cannot Render the Prior Art Unsatisfactory for Its Intended Purpose." These guidelines in the MPEP make it clear that the Office's rejection of the present claims in view of Shimanuki is incorrect as a matter of law.

Replacing the humidifying apparatus of Shimanuki with a dehumidifying apparatus is directly contradictory to the purpose, intent and function of the Shimanuki fuel cell system.

The Office stated: "a different fuel cell might require that they be dehumidified, depending on the type of membrane used in the fuel cell" and cited to Shimanuki at column 2, line 64 through column 4, line 6 as support. However, the disclosure cited by the Office does not suggest that the prior art fuel cell system would work or otherwise be functional if a dehumidifying apparatus (i.e., instead of a humidifying apparatus) is used therein. The Office's assertion that the prior art may be modified is completely unsupported and is directly contradictory to the disclosure of Shimanuki. Thus, the rejection is not in conformance with either the Office's policy as set forth in MPEP § 2145(X)(D) and MPEP § 2143.01.

Neither of Dickman or Wattelet remedies the contradictory and defective aspects of the Shimanuki disclosure. Applicants thus submit that the original claims are not obvious in view of the prior art relied upon by the Office and respectfully request withdrawal of the rejections.

Respectfully submitted,

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